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**Dispensing device for flexible container with a
recloseable cap**

Background of the invention

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The present invention relates to a dispensing device for a flexible container with a recloseable cap, for products in a pasty state.

10 A flexible container is often used to contain a cosmetic product in a pasty state such as a sun cream, for example. If the product is to be effective it must be delivered in defined quantities. However, the pressure exerted on the walls of the tube by the user 15 cannot be relied upon to dispense the same amount over time because the pressure is variable in duration and magnitude.

20 Dispensing devices must therefore be used. The constraints on such dispensing devices designed for ordinary use are:

- 25 - ease of use,
- simplicity of design in order to ensure a low economic cost compatible with mass production,
- small size, and
- ease of transport.

30 However, the quantity dispensed does not have to be very precise.

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Description of the prior art

Various existing dispensers based on the use of pumps have been described and used. However, these dispensers 35 are unsuitable for use with tubes of sun cream likely to be carried in a pocket. Moreover, pumps are relatively complicated devices and therefore expensive.

Plunger devices have also been described: These comprise a dispensing chamber fixed near to the opening of the container, a plunger sliding back and forth inside the chamber when acted upon by the pressure of the liquid between two extreme positions. The plunger can be provided with restoring means such as a spring. The movement of the plunger defines a position in which the dispensing chamber is filled and a position in which the dispensed quantity is delivered. Documents DE 4 310 019, EP 0 560 839 and EP 1 164 362 disclose such devices. These devices can be complicated to operate and have to be used in a certain position. Furthermore, the devices used are composed of a large number of parts, which is incompatible with distribution on a mass scale.

Lastly, devices using a diaphragm have been described, comprising a diaphragm connected to a rod to which is attached a head capable of closing the opening of a container and of defining positions of filling and of delivering the measured quantity of liquid. Documents GB 1 054 307 and US 3 134 514 describe such devices. In the first document, the dispensed quantity is measured precisely by filling a cavity in the body of the rod. In the second document, the openings in the diaphragm through which the liquid is able to pass are closed by a fold of the diaphragm when pressure is applied during the delivery phase.

In both cases the liquid is retained in a well-defined measuring chamber. As a result of this, the pressure applied to the liquid in the measuring chamber is relatively slight.

Thus, document US 3 134 514 indicates that the container must be turned upside down, its opening pointing toward the ground, in order to deliver the liquid, whereas document GB 1 054 307 applies to pressurized fluids which may be gases. The accuracy of

these devices is good but they are not suitable for pasty liquids or for ordinary consumer use.

Summary of the invention

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The present invention alleviates these problems by providing a solution based on a small number of parts, and ease of use, as it can be used in any position.

10 To this end, the invention relates to a dispensing device for a flexible container with a recloseable cap, for products in a pasty state, characterized in that it comprises:

- a cylindrical part fixed to the sealing lip or to the neck of the container,
- a diaphragm joined to the cylindrical part and containing openings,
- a cylindrical body in the center of the diaphragm, its cross section being greater than the opening of the container, and
- a head formed on the end of the cylindrical body, its cross section increasing with distance from the cylindrical body, the greatest cross section of the head being of a diameter approximately equal to the opening of the container,

25 and in that the body and the head, which are both joined to the diaphragm, are able to move in the axis of the opening of the container when pressure is exerted on the walls of the container and applied to the diaphragm, between:

- a first or at-rest position of closure, the head closing the opening of the container by means of its part of greatest cross section when no pressure is being exerted, and
- a second or limit position of closure, the cylindrical body whose diameter is greater than the opening pressing against the edge of the latter, thus closing the opening because of the pressure, the successive positions taken up by the cylindrical

body and the head during their intermediate travel between the two positions of closure producing an annular space between the edge of the opening and a part of the head whose cross section is smaller than 5 the diameter of the opening, permitting delivery of the product contained in the container.

The configuration described here of the device enables 10 the desired amount of product to be dispensed from a simple geometry. In addition, a direct passage is maintained between the body of the container and the external environment, which ensures there is sufficient pressure to push the product out of the container.

15 Advantageously, the elasticity of the diaphragm enables the body and the head to be returned to the rest position when the pressure on the walls of the container is removed.

20 The use of an elastic diaphragm avoids the need for springs or other restoring means. This approach means that the device can be used in any position, with the opening pointing up or down.

25 In one possible version, the diaphragm is of an annular general shape of the same axis as on the opening, bounded on its outer edge by the cylindrical part and on its inner edge by the cylindrical body.

30 Advantageously, in the rest position, the diaphragm is in the general shape of a frustum of a cone, the apex of which points toward the center of the container.

35 Owing to its eccentric orientation, the annular and frustoconical shape of the diaphragm accentuates the elastic pressure that tends to return the device to its rest position.

In another possible version, the diaphragm comprises a

cylindrical portion having undulations in the form of bellows able to exert pressure elastically to return the body and head to the rest position when the pressure on the walls of the container is removed.

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Advantageously, the device is produced in elastomer as a single part.

10 The structure of the device enables it to be produced as a single part, this part being of elastomer, which gives the diaphragm its elasticity.

15 In another possible version, the cylindrical part is crimped to the sealing lip or to the neck of the container.

In another possible version, the device is built into a ring with a thread so that it can be screwed onto the sealing lip or onto the neck of the container.

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In another possible version, the device is overmolded onto the sealing lip or onto the neck of the container.

Brief description of the drawings

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A clearer explanation of the invention will be provided by the description which follows, with reference to the attached diagrammatic drawing showing two embodiments of the dispensing device.

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Figure 1 is a cross section through the device in a first embodiment in the closed, rest position.

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Figure 2 is a cross section through a first embodiment in an intermediate position.

Figure 3 is a cross section through a first embodiment in a limit position of closure.

Figure 4 is a cross section through a second embodiment.

Description of the preferred embodiment

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Figures 1, 2, and 3 show a dispensing device 2 according to the invention mounted on a flexible container 3 having a recloseable opening 4 for cosmetic products.

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The body 5 of the flexible container 3 can be extruded in polyethylene, for example. A molded polypropylene head 6 is then welded to this body 5. The head 6 has a neck 7 with a screw thread 8 and a shoulder 9 formed on 15 its outer wall.

The recloseable cap 4 is made up of a base 10 and a lid 12.

20 Screwed onto the head 6 is the base 10 which comprises:

- an outer covering skirt 13 of the same axis as the neck 7, its diameter approximately equal to that of the shoulder 9 of the head 6;
- fixing means consisting of a fixing skirt 14 of the 25 same axis as the outer skirt 13 but of smaller diameter, with an inside thread 15 fitting onto an outside thread 8 made on the neck 7 of the container 3 so that the base 10 can be screwed to the head 6;
- sealing means consisting of an inner sealing lip 16 30 of the same axis as the two skirts 13 and 14, this lip 16 also being formed on the base 10 and having an outside diameter that fits the inside diameter of the neck 7 of the container 3 so as to seal it when the base 10 is screwed to the head 6;
- lid-locking means consisting of a vertical cylindrical wall 17 of the same axis as the skirts 13 and 14, this wall 17 extending outward from the container and comprising an inward return 18; and
- at right angles to the axis of the neck, a cup-shaped

wall 19 containing a round orifice forming the opening 20 of the container.

The base 10 is connected to the generally circular lid 12 by a hinge formed by a film 22.

This lid 12 comprises:

- a first cylindrical external covering wall 23 of the same diameter as the covering skirt 13;
- 10 - locking means consisting of a cylindrical wall 24 whose axis is perpendicular to the lid 12 and whose radius is such that it fits the cylindrical wall 17 intended to be locked by the return 18 present on the latter wall when the cap 4 is closed; and
- 15 - a cylindrical finger 25 projecting from the inside face of the lid 12 and approximately equal in diameter to the opening of the container 20, this finger bearing on the edges of the latter opening when the cap 4 is closed to form a seal.

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The device 2 of the invention comprises, in a first embodiment:

- a cylindrical part 26 fixed to the sealing lip 16, its outside diameter being such as to fit the inside diameter of the sealing lip 16 to keep it in position;
- 25 - a diaphragm 27 joined to the cylindrical part 26 and containing openings 28 to let the product move from the body of the container 5 toward the opening 20, this diaphragm being in the general shape of a frustum of a cone with its apex toward the center of the container 3;
- 30 - a cylindrical body 29 in the center of the diaphragm 27, its cross section being greater than the opening 20 of the container; and
- 35 - a head 30 formed on the end of the cylindrical body 29, its cross section increasing with distance from the cylindrical body 29, the greatest cross section of the head 30 being of a diameter approximately

equal to the opening 20 of the container.

The device 2 is produced in elastomer as a single part, making for very simple assembly and an economical low 5 cost.

Figure 1 shows the device 2 in the rest position. The opening 20 is closed by the part of greatest cross section of the head 30. The lid 12 is closed with the 10 finger 25 sealing the opening 20. If the lid is opened, the head 30 continues to close off the opening 20 in the absence of pressure on the walls of the container 3.

15 Figure 2 shows the device 2 during the delivery of a defined quantity of product. When pressure is exerted on the walls of the container 3, it is applied to the membrane 27. The cylindrical body 29 and the head 30, both attached to the membrane 27, move along the axis 20 of the opening 20, thus freeing up an annular space 32 between the edge of the opening 20 and a part of the head 30 whose cross section is smaller than the diameter of the opening. In this configuration the product contained in the container 3 is delivered. A 25 direct passage is present between the body of the container and the external environment, passing via the openings 28 and the annular space 32, enabling the defined quantity of product to be delivered easily with transmission of satisfactory pressure.

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Figure 3 shows the device 2 in the limit position. Under pressure, the cylindrical body 29 and the head 30 continue to advance until the cylindrical body 29 whose 35 diameter is greater than the opening 20 is pressing against the edge of the said opening 20. In this position the opening 20 is closed.

The advance of the cylindrical body 29 and head 30 between the two positions of closure of the opening 20

permits one approximately constant defined quantity of the product held in the container 3 to be delivered.

5 The elasticity of the diaphragm 27 allows the device 2 to return to its rest position when the pressure on the walls of the container 3 is removed.

10 Figure 4 shows a second embodiment of the device 2, in which the diaphragm 27 has a cylindrical portion 33 with bellows-like undulations 34 able to exert elastic pressure to return the body 29 and the head 30 to the rest position when the pressure on the walls of the container 3 is removed.

15 The invention is not limited to the embodiment described and instead encompasses all variants thereof. One particular example is that the method by which the dispensing device 2 is fixed to the container 3 may take different forms.

20 Instead of securing the device 2 by crimping the cylindrical part 26 in the sealing lip 16, it is possible to:

- crimp it directly to the neck 7 of the container 3,
- 25 - incorporate the dispensing device 2 into a ring that is threaded, allowing it to be screwed to the neck 7 of the container 3 or into the base 10, and
- produce the device 2 by twin-shot injection molding or overmolding onto a neck 7 of the container 3, in
- 30 which case the cylindrical part 26 can be the inside of the neck 7 of the container 3.